

39260/EAG/C766

CLAIMS

1 1. A beam shearing system comprising:

2 an entrance slit structure having an entrance
3 slit extending in a first direction for receiving a
4 beam of light having a photon flux within a
5 predetermined spectral pass band;

6 a beam splitter aligned at an angle to the first
7 direction so that the received beam of light is split
8 into two separate beams; and

9 a reflective subsystem having a plurality of
10 reflective surfaces defining separate light paths of
11 equal optical path length for the two separate beams,
12 the reflective surfaces arranged such that when the
13 two beams emerge from the beam shearing system they
14 contain more than 50 percent of the said photon flux
15 and the chief rays of the two separate beams are
16 substantially parallel to each other.

1 2. The beam shearing system in claim 1 wherein:

2 said two beams emerging from the beam shearing
3 system contain substantially all of the light entering
4 the system through the entrance slit.

1 3. The beam shearing system in claim 1 wherein:

2 said two light paths being of substantially equal
3 optical path length and causing the wave fronts of the

39260/RAG/C766

1 two separate beams to remain substantially in phase
2 relative to one another.

1 4. The beam shearing system in claim 1 wherein:

2 said plurality of reflective surfaces are further
3 arranged so that the separate beams of light are of
4 substantially equal intensity, when they emerge from
5 the beam shearing system.

1 5. The beam shearing system in claim 1 wherein:

2 the reflective subsystem comprises a plurality of
3 bodies with a beam splitter therebetween; and

4 the entrance and exit surfaces of the plurality
5 of bodies are substantially perpendicular to the chief
6 ray of the received beam of light.

1 6. A spectral resolving system comprising:

2 an entrance slit structure having an entrance
3 slit extending in a first direction for receiving a
4 beam of light having a photon flux within a
5 predetermined spectral pass band;

6 a beam shearing system including:

7 a beam splitter aligned at an angle to the
8 first direction so that the received beam of
9 light is split into two separate beams;

39260/RAG/C766

1 a reflective subsystem having a plurality of
2 reflective surfaces defining separate light paths
3 of equal optical path length for the two separate
4 beams, the reflective surfaces arranged such that
5 when the two beams emerge from the beam shearing
6 system they contain more than 50 percent of the
7 said photon flux and the chief rays of the two
8 separate beams are substantially parallel to each
9 other; and

10 an optical system focusing the said two separate
11 beams of light emerging from the said beam shearing
12 system into an exit pupil.

1 7. The spectral resolving system of claim 6 wherein:

2 said optical system also focuses the said
3 separate beams of light emerging from the said beam
4 shearing system to create an image.

1 8. The spectral resolving system of claim 7 wherein:

2 said optical system has an optical axis;

3 said exit pupil is located in one of the group
4 consisting of a tangential plane and a sagittal plane
5 relative to the said beam shearing system;

6 said image is located in the other of the group
7 consisting of a tangential plane and a sagittal plane
8 relative to the said beam shearing system; and

39260/RAG/C766

1 the exit pupil and the image are located at
2 substantially the same position along the optical
3 axis.

1 9. The spectral resolving system of claim 6 wherein:
2 the optical system is telecentric in the said
3 exit pupil plane.

1 10. The spectral resolving system of claim 6 wherein:
2 the optical system is anamorphic.

1 11. The spectral resolving system of claim 6 wherein:
2 the said optical system cancels aberrations when
3 it recombines the two beams of light that emerge from
4 the beam shearing system.

1 12. A static interferometer comprising:
2 fore-optics for collecting light and focusing it
3 into a beam;
4 a spectral resolving system comprising:
5 an entrance slit structure having an
6 entrance slit extending in a first direction for
7 receiving a beam of light having a photon flux
8 within a predetermined spectral pass band;
9 a beam shearing system including:

39260/RAG/C766

1 a beam splitter aligned at an angle to
2 the first direction so that the received
3 beam of light is split into two separate
4 beams;

5 a reflective subsystem having a
6 plurality of reflective surfaces defining
7 separate light paths of equal optical path
8 length for the two separate beams, the
9 reflective surfaces arranged such that when
10 the two beams emerge from the beam shearing
11 system they contain more than 50 percent of
12 the said photon flux and the chief rays of
13 the two separate beams are substantially
14 parallel to each other; and

15 an optical system focusing the said two
16 separate beams of light emerging from the said
17 beam shearing system onto an exit pupil; and
18 a detector located at the exit pupil.

1 13. The static interferometer in claim 12 wherein:

2 the detector comprises a detector array, read
3 out electronics and a data processing system.

1 14. The static interferometer in claim 13 wherein:

2 the detector array records the intensity of the
3 radiation incident on its pixels;

39260/RAG/C765

1 the read out electronics digitizes the intensity
2 measurements made by the detector array and transfers
3 them to the data processing system; and

4 the data processing system manipulates the
5 digitized measurements to obtain information about the
6 spectrum of said incident radiation.

1 15. The static interferometer in claim 14 wherein:

2 the data processing system performs Fast Fourier
3 Transforms on the digitized measurements to obtain the
4 spectral composition of the incident radiation;

1 16. The static interferometer in claim 14 wherein:

2 the data processing system convolves the
3 digitized measurements with digital filters to detect
4 the presence or absence in the spectrum of the
5 incident radiation of frequencies of radiation
6 characteristically emitted or absorbed by particular
7 substances.

39260/RAG/C766

1 17. The static interferometer in claim 12 wherein:

2 a single sided interferogram is created at said
3 exit pupil.

1 18. The static interferometer in claim 17 wherein:

2 the fore-optics focus the collected light in such
3 a way that the chief ray of the said collected light
4 describes paths through the said spectral resolving
5 system, which recombine on the said exit pupil at the
6 edge of the said detector array; and

7 said paths of the chief ray have substantially
8 the same optical path length.

1 19. The static interferometer in claim 18 wherein:

2 said fore-optics have a shifted pupil design.

1 20. The static interferometer in claim 18 wherein:

2 said fore-optics are telecentric.

1 21. The static interferometer of claim 12 wherein:

2 said optical system also focuses the said
3 separate beams of light emerging from the said beam
4 shearing system to create an image.

39260/RAG/C765

1 22. The static interferometer of claim 21 wherein:

2 said optical system has an optical axis;

3 said exit pupil is located in one of the group
4 consisting of a tangential plane and a sagittal plane
5 relative to the said beam shearing system;

6 said image is located in the other of the group
7 consisting of a tangential plane and a sagittal plane
8 relative to the said beam shearing system; and

9 the exit pupil and the image are located at
10 substantially the same position along the optical
11 axis.

1 23. A beam shearing system comprising:

2 an entrance slit structure having an entrance
3 slit extending in a first direction for receiving a
4 beam of light having a photon flux within a
5 predetermined spectral pass band;

6 a beam splitter aligned at an angle to the first
7 direction so that the received beam of light is split
8 into two separate beams;

9 a reflective subsystem having a plurality of
10 reflective surfaces defining separate light paths of
11 equal optical path length for the two separate beams,
12 the reflective surfaces arranged such that one of the
13 separate beams undergoes one reflection and the other
14 of the separate beams undergoes three reflections and

39260/RAG/C766

1 that when the two beams emerge from the beam shearing
2 system they contain more than 50 percent of the said
3 photon flux.

1 24. A static interferometer comprising:

2 fore-optics for collecting light and collimating
3 into a beam, the fore-optics possessing an exit pupil;

4 a spectral resolving system comprising:

5 an entrance slit structure having an
6 entrance slit extending in a first direction for
7 receiving a beam of light having a photon flux
8 within a predetermined spectral pass band;

9 a beam shearing system comprising:

10 a beam splitter aligned at an angle to
11 the first direction so that the received
12 beam of light is split into two separate
13 beams;

14 a reflective subsystem having a
15 plurality of reflective surfaces defining
16 separate light paths of equal optical path
17 length for the two separate beams, the
18 reflective surfaces arranged such that one
19 of the separate beams undergoes one
20 reflection and the other of the separate
21 beams undergoes three reflections and that
22 when the two beams emerge from the beam

39260/RAG/C756

1 shearing system they contain more than 50
2 percent of the said photon flux; and

3 a detector located at said exit pupil where the
4 two beams emerging from the beam shearing system
5 converge.

1 25. The static interferometer in claim 24 wherein:

2 the detector comprises a detector array, read
3 out electronics and a data processing system.

1 26. The static interferometer in claim 25 wherein:

2 the detector array records the intensity of the
3 radiation incident on its pixels;

4 the read out electronics digitizes the intensity
5 measurements made by the detector array and transfers
6 them to the data processing system; and

7 the data processing system manipulates the
8 digitized measurements to obtain information about the
9 spectrum of said incident radiation.

1 27. The static interferometer in claim 26 wherein:

2 the data processing system performs Fast Fourier
3 Transforms on the digitized measurements to obtain the
4 spectral composition of the incident radiation;

39260/PAG/C766

1 28. The static interferometer in claim 27 wherein:

2 the data processing system convolves the
3 digitized measurements with digital filters to detect
4 the presence or absence in the spectrum of the
5 incident radiation of frequencies of radiation
6 characteristically emitted or absorbed by particular
7 substances.

1 29. The static interferometer in claim 24 which further
2 comprises:

3 an anamorphic optical system possessing an
4 optical axis;

5 the exit pupil being perpendicular to the optical
6 axis;

7 the optical system focusing the two beams
8 emerging from the beam shearing system to create an
9 image; and

10 the image being perpendicular to the exit pupil
11 and perpendicular to the optical axis.